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1<sup>st</sup> Mid-Term Exam

Class: B.E.+MBA 1<sup>st</sup> and F.T. 1<sup>st</sup>

Subject: Introduction to Eng. and Tech.

Duration: 1 hour

Total marks: 30

Instruction:

- Answer all questions.
- In case of conversions, write conversion factor.

1. Briefly explain the various specialization of engineering field and explain the problems faced by chemical engineers. (CO1) (10)

2. Convert the following (CO2)

a. 40 g NaCl to lb mol (2)

b. Commercial sulfuric acid is 97% H<sub>2</sub>SO<sub>4</sub> and 3% H<sub>2</sub>O. What is the mole ratio of H<sub>2</sub>SO<sub>4</sub> to H<sub>2</sub>O. (2)

c. Convert the following into SI units  $\frac{6(in)(cm^2)}{(yr)(s)(lb_m)(ft^2)}$  (2)

d. A relation for dimensionless variable called the compressibility (z), which is used to describe the pressure-volume-temperature behavior for real gases, is

$$z = 1 + B\rho + C\rho^2 + D\rho^3$$

Where  $\rho$  is the density in g mol/cm<sup>3</sup>. What are the units of B,C and D? (4)

3. a. A pressure gauge on the welder's tank gives a reading of 22.4 psig. The barometric pressure is 28.6 in. Hg. Calculate the absolute pressure in the tank in (i) lb/ft<sup>3</sup>, (ii) in.Hg (iii)N/m<sup>2</sup>, (iv) ft water (CO2) (5)

b. You have 130 Kg of gas of the following composition: 40% N<sub>2</sub>, 30% CO<sub>2</sub> and 30% CH<sub>4</sub> in the tank. What is average molecular weight of the gas. State the basis for the problem. (CO2) (5)